Differential Effects of Generative Learning Strategies on Iraqi EFL Students' Speaking Ability: Technology-based and Traditional Classes in Focus

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التأثيرات التفاضلية لاستراتيجيات التعلم التوليدي على قدرة الطلاب العراقيين في اللغة الإنجليزية كلغة أجنبية على التحدث: التركيز على الفصول الدراسية التقليدية والمبنية على التكنولوجيا.

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Abstract

Research (e.g., Brod, 2020) has shown that if Generative Learning Strategies (GLSs) are employed in teaching/learning contexts, they can highly and effectively help learners to construct their understanding of the material they are learning; and hence, promote learning outcome. Also, it has been indicated (e.g., Golonka et al., 2014) that technologies such as the internet, smart phones, etc. have been adopted for EFL pedagogy and have positively affected teaching/learning condition. The present study, therefore, aimed at investigating whether teaching GLSs together with using available technologies in Iraqi EFL undergraduate context would significantly affect learners' speaking performance. To this end, 107 Iraqi EFL students were invited to participate in the study. They were divided into three groups: Two experimental (a traditional classroom with GLSs, and a technology-based classroom with GLSs) and one control groups. Nine GLSs were taught and employed in the two experimental groups. The three groups were tested by the same speaking measure at the end of the experiment. T-test and ANOVA, were then run on the collected date. The results indicated that speaking performance for the students in the technology-based experimental, as opposed to the traditional group improved significantly In the same way, the traditional experimental group significantly outperformed the control group. Pedagogical implications concerning the effects of using GLSs in EFL classrooms are discussed, and some suggestions are made for future studies.

Keywords: Summarising, Mapping, Drawing, Imagining, Enacting

المستخلص

أظهرت الأبحاث (على سبيل المثال، Brod, 2020)أنه إذا تم استخدام استراتيجيات التعلم التوليدية (GLSs) في سياقات التدريس/التعلم، فإنها يمكن أن تساعد المتعلمين بشكل فعال للغاية على بناء فهمهم للمواد التي يتعلمونها؛ وبالتالي تعزيز نتائج التعلم. كما تمت الإشارة (على سبيل المثال، Golonka et al., 2014)إلى أن التقنيات مثل الإنترنت والهواتف الذكية وما إلى ذلك قد تم تكييفها لتتناسب مع أصول تدريس اللغة الإنجليزية كلغة أجنبية وكان لها تأثير إيجابي على حالة التدريس/التعلم. ولذلك، تهدف الدراسة الحالية إلى التحقق مما إذا كان تدريس GLSs مع استخدام التقنيات المتاحة في سياق اللغة الإنجليزية كلغة أجنبية للطلاب الجامعيين العراقيين سيؤثر بشكل كبير على أداء التحدث لدى المتعلمين. ولتحقيق هذه الغاية، تمت دعوة ١٠٧ طلاب عراقيين للغة الإنجليزية كلغة أجنبية للمشاركة في الدراسة. تم تقسيمهم إلى ثلاث مجموعات: مجموعتان تجريبيتان (فصل دراسي تقليدي مزود بأنظمةGLS ، وفصل دراسي قائم على التكنولوجيا مزود بأنظمة (GLS ومجموعة ضابطة واحدة. تم تدريس تسعة GLSs وتوظيفها في المجموعتين التجريبيتين. تم اختبار المجموعات الثلاث بنفس مقياس التحدث في نهاية التجربة. تم بعد ذلك تشغيل اختبار T و ANOVAفي التاريخ الذي تم جمعه. أشارت النتائج إلى أن أداء التحدث لدى الطلاب في المجموعة التجريبية القائمة على التكنولوجيا، مقارنة بالمجموعة التقليدية قد تحسن بشكل ملحوظ. وبنفس الطريقة، تفوقت المجموعة التجريبية التقليدية بشكل ملحوظ على المجموعة الضابطة. تمت مناقشة الآثار التربوية المتعلقة بآثار استخدام GLSs في الفصول الدراسية للغة الإنجليزية كلغة أجنبية، وتم تقديم بعض الاقتراحات للدراسات المستقبلية.

الكلمات المفتاحية: التلخيص، رسم الخرائط، الرسم، التخيل، التمثيل

Introduction

The need for associative learning, as opposed to rote learning, has decreased since the world requires individuals who can choose, interpret, and employ information to solve problems they have not previously faced (Fiorella & Mayer, 2015). It is generally agreed that education should prepare students for the twenty-first-century skills required for work and life (Pellegrino & Hilton, 2012). Today's focus on these skills can be considered a call for generative learning, which assists individuals in developing transferable skills and knowledge. These skills include adaptability, critical thinking, creative problem-solving, making evidence-based arguments, and complex communication (Pellegrino & Hilton, 2012).

The need to have skills based on transferable knowledge means the learners should be helped to be self-regulated individuals who enjoy efficient learning strategies for meaningful learning and can recognize when to employ them (Pellegrino & Hilton, 2012). This necessity is because learning depends on the information presented and the learner's cognitive processing at the time of learning (Fiorella & Mayer, 2015).

According to Fiorella and Mayer (2016), two routes which can be effective in fostering the learning of students are developments in the methods of instruction and the learners' learning strategies. Over the years, many researchers have increasingly focused on the efficacy of methods of instruction. Considering today's emphasis on education on preparing learners for the 21st century (Pellegrino & Hilton, 2012), an attempt to find influential learning strategies that improve learners' understanding is an essential issue in education. Hence, learning strategies need further research, especially in EFL contexts where, in most cases, the opportunities for learning English are not adequate.

Like many EFL contexts, in Iraq, language education in high schools and universities is handled based on the teachers' lecturing. The learners' responsibilities are limited to translating and memorizing words and grammatical points. In such a context, where language learners do not do meaningful tasks, one helpful approach is to encourage learners to be engaged in generative learning activities, those initiated by the learners during learning, encouraging them to construct meaning from what they learn via organizing and integrating it with their own prior knowledge (Fiorella et al., 2021).

Further, students are expected to act as effective learners; however, are seldom helped learn how to learn. Hence, improving generative learning strategies (GLSs) is one aspect of the hidden curriculum– what the students are expected to learn but are not taught (Fiorella & Mayer, 2015). Encouraging learners to employ GLSs can enhance the frequency of using proper learning strategies (Breitwieser & Brod, 2021). In concert with what (Brod, 2020) suggests, GLSs can be employed to develop learning by encouraging learners to construct their understanding of the material they are learning in an active way.

Although many studies have shown the positive impacts of GL-based instruction, they have rarely considered language learning. Thus, more studies are necessary to shed light on using GLSs in EFL context worldwide. This shows more importance in contexts like Iraq, where EFL education is still relying on traditional methods and does not develop autonomous learners. The present study, therefore, aims to investigate how GLSs can contribute to Iraqi EFL learners' autonomous development and, in so doing, takes such learners' speaking ability into closer scrutiny.

Literature review

In this section, we focus particularly on introducing the strategies used in generative learning and then report a few studies where such strategies were put into practice and analysis.

Popular strategies in generative learning

The following section presents the most influential learning strategies for developing generative learning. In this list, practice strategies, management strategies, and low-level strategies are not included.

1. **Summarizing:** Summarizing is succinctly expressing a material's critical points in one's own words. From the perspective of GL theory, an appropriate summary is not just a copy of words or phrases word for word from the text. A good summary should be choosing the most related points from the text, arranging them into a coherent framework like an outline, and then combining this framework with the learners' prior experiences and knowledge (Fiorella & Mayer, 2016).
2. **Mapping:** Concept maps show the hierarchy and relationships among concepts (Brod, 2020). Their primary function is to activate related existing knowledge. In learning by mapping, several techniques are used to turn the spoken or printed text into a spatial structure of words and provide connections, e.g., knowledge maps, graphic organizers, and concept maps (Brod, 2020)
3. **Drawing:** This strategy helps the learner generate a drawing to represent the content of a text. The drawing may be done by hand or computer (Leutner & Schmeck, 2014). The main difference between drawings and concept maps is that in the latter, physical similarities of the concepts are rare (Van Meter & Garner, 2005).

4. **Imagining:** Here, learners construct mental images that show their understanding of the content of a text (Fiorella & Mayer, 2016).
5. **Self-testing:** Self-testing is known as the testing impact or retrieval-based learning (Fiorella & Mayer, 2016). It means responding to practice questions about the material learned previously. According to GL theory, this strategy effectively activates and retrieves learners' most related information and knowledge, arranges the material through strengthening the available links between the components of the prior knowledge, and combines the material through constructing new relations between what has been learned previously and with other related previously acquired information (Fiorella & Mayer, 2016).
6. **Self-explaining:** Self-explaining is the practice of explaining the subject content to oneself while learning (Fiorella & Mayer, 2016). When students are asked to explain the content, they are prompted to produce inferences that surpass the given knowledge and alter their mental models (Chi, 2000). Hence, the students require reasoning abilities to produce explanations because they must infer additional information based on the existing knowledge (Brod, 2020).
7. **Teaching:** In learning by teaching, the to-be-learned material is explained to help others learn. From the perspective of GL theory, in learning by teaching, the most related information to be included in a learner's explanation is selected, the material is prepared as a coherent form which other individuals realize, and then the material is elaborated on via incorporating an individual's prior knowledge (Fiorella & Mayer, 2016).
8. **Enacting:** This refers to learner's engagement in task-related movements while he/she learns something. These movements

may include manipulating objects or performing gestures based on their learned lesson (Fiorella & Mayer, 2016).

9. **Generating predictions:** To generate a prediction, a learner needs to access prior information and link it to the new knowledge learned (Schmidt et al., 1989). Moreover, prediction generation can arouse interest in finding the correct reply (Brod & Breitwieser, 2019; Potts et al., 2019), and if the correct reply is not the same as the prediction, the learner may become surprised (Brod et al., 2018). Surprise and curiosity are epistemic emotions which may result in augmented attention to the to-be-learned knowledge that reinforces learning (D'Mello et al., 2014).
10. **Generating questions:** The learners should have access to relevant prior knowledge and be able to elaborate on it to ask a good question (Brod, 2020). An essential instructional objective of question generation is helping learners recognize the gaps in their knowledge (Brod, 2020).

The above strategies have been subject to various investigations in the literature. Below, we bring some of the most related studies to education in general and EFL education in particular.

Previous studies on GLSs

In 2010, Schwamborn et al.ran a study on ninth graders. The students were asked to read a short text on chemistry. One group received instruction in making a drawing, while the other group did not receive such instruction. The drawing group acted better than the control group on the transfer test. Schwamborn et al.'s research demonstrated the beneficial effect of generative drawing. It showed that students' comprehension of a scientific text is better if they are instructed to produce a drawing that illustrates the content of the text.

In another study, Sarani and Jabbari (2010) examined the impacts of two generative strategies of question generation and summarizing on reading comprehension and recall of literary texts among Iranian EFL learners. Sixty-three male and female participants in three homogeneous groups of undergraduates took part in their study. The researchers randomly assigned the participants to three groups who attended a 'short-stories' course. Those in Group A were instructed to summarize the stories, those in Group B were asked to generate questions from the stories, and those in Group C (the control group) were not trained for the above two strategies. The reading comprehension achievement and recall test findings showed that the two experimental groups could significantly outperform the control group.

Moreover, Leopold and Mayer (2015) studied college students who were asked to read an online short text on the function of human respiratory system; they presented one paragraph on the screen at a time. The imagining group was instructed to form mental images for the scientific text. For every paragraph, they were provided with a focused prompt to create a mental image which contained particular sections of the respiratory system. The imagining group could significantly outperform the control group.

Similarly, Eric (2018) examined the impact of GLSs on the students' academic achievement and motivation in learning physics in Ghana. The participants were 98 male and female learners, including high and low achievers. A Multiple-Choice test (MC) was used to collect data on students' academic improvement before and after the treatment. Also, a Motivation Perception Survey on Generative Learning (MPSGL) was administered to the participants before and after the treatment. The results indicated that the students instructed through GLSs performed significantly

better in the MC test than those taught via the lecture method. The findings also suggested that GLSs could increase the students' motivation in learning physics. The study, however, found no significant differences between male and female students and high and low achievers in their performance and using GLSs.

In a more recent study, Brod (2020) studied the age-related effectiveness of some GLSs, including questioning, drawing, predicting, concept mapping, explaining, and testing. Brod (2020) wanted to find out if any age-related difference existed in the effectiveness of GLSs. The study showed that all six GLSs were influential for university students; however, the findings were mixed for the younger students. While strategies such as predicting and practice testing were seemingly effective in lower-elementary-school children, other strategies, including questioning and drawing, only had effectiveness in secondary school.

In the same line, Breitwieser and Brod (2021) compared the effects of two GLSs on university students and late-elementary-school children. The participants did a learning task in which they produced examples or predictions before receiving the correct answer. Moreover, some tasks were given to the participants to assess their reasoning ability, which is considered a requirement to generate valuable examples. The findings indicated that although the university students could succeed in learning facts in the two GLS conditions, the elementary school children enjoyed more success in generating a prediction than in generating an example. Children's reasoning abilities were found influential in the results' difference.

In addition, Fiorella (2020) investigated college students who studied the human respiratory system. The participants were asked to explain what they had learned on the video to an

imaginary partner. In so doing, the participants either generated their own words and visuals on a whiteboard or viewed teacher-provided visuals and words when they were explaining aloud. The participants who explained visuals (provided or generated) showed higher levels of constructing knowledge and better performance on the post-test than those who explained words (provided or generated).

Although much previous research has confirmed the positive effects of GL-based instruction, the problem is many of such studies have not been carried out in language learning contexts. Moreover, some studies in the literature have not reported any benefit for GL-based instruction. For example, Souvignier and Kronenberger (2007) found no positive effect of question training on learning. In their study, the participants could not profit from question generation, although they had been instructed intensively in generating questions.

Given the literature, this study attempts to examine the impacts of GL-based teaching on language learning among Iraqi EFL undergraduates.

The purpose of this study is to show if language instruction based on GL principles can generally lead to better results in terms of language achievement. It intends to assess the effectiveness of GLSs, including generating concept maps, summarizing, generating explanations (elaborative interrogation or self-explanation), generating predictions, teaching, self-testing, and enacting among Iraqi EFL undergraduates. These learning strategies mainly promote generative processing during learning to construct meaning from the presented material (Fiorella & Mayer, 2015).

More specifically, the present study aims to compare the impacts of applying GLSs in two language learning environments,

technology-based and traditional ones, to determine in which context these learning strategies work with significantly better results. The rationale for this comparison is that well-established technologies for foreign language (FL) learning, for example, having access to the Internet, are currently present in many contexts. As technologies become readily available, mature, and adapted for FL pedagogy, teachers may change their teaching strategies or adjust their activities to use existing resources most effectively (Golonka et al., 2014).

The present research, therefore, sets out to address the following research questions:

1. Does GL-based instruction significantly affect Iraqi EFL university students' speaking ability?
2. Does GL-based instruction in two classroom modes (traditional vs. technology-based) significantly affect Iraqi EFL university students' speaking ability?

Method

The above two research questions needed to be addressed via an experimental design. The dependent variable here was speaking ability, and the independent variables were GLS instructions and classroom mode.

Participants

The participants of the study consisted of 107 Iraqi EFL learners at the language college of Baghdad University, Baghdad, Iraq. Convenience sampling was used to select the study's participants. All the participants were native speakers of Arabic and were taking conversation courses to improve their listening and speaking abilities. Regarding gender, 49 (45.7%) participants were

males and 58 learners (54.2%) were females. Their ages ranged from 18 to 29.

The participants were randomly divided into three general groups: The first group was the control group. This was instructed through conventional language teaching methods in a regular classroom mode. No focus on GLSs was made in the control group. The second group served as the experimental one (EXG1). The students in this group attended a regular classroom mode and had explicit training in some GLSs. The third group, experimental group two (EXG2), had their classes in a language laboratory, which was equipped with numerous technological tools for language learning. This group was also subjected to explicit training in applying GLSs while learning language.

Instruments

Several tests were used in this study to collect data.

Pre-test and post-test of speaking: A sample IELTS test was chosen from a test bank comprised of IELTS tests collected from various textbooks written on preparations for the test and was given to the participants in the three classes as pre-test and post-test.

For scoring oral performances, each participant was scored according to the IELTS Speaking Descriptor, which is considered a standard scale for scoring (IELTS developed this detailed performance descriptor and described a nine-band spoken performance assessment system based on four criteria identified by Seedhouse et al. (2014)). As for the reliability of the test, the researcher recorded the students' total responses, which were later subject to rating by two expert judges. The interrater reliability of the final scores were calculated using Cronbach's Alpha. This showed .89 as the test's scoring reliability.

Data collection procedure

The treatment lasted for one semester, 28 sessions. First, all the participants took the pre-test. The control group received conventional methods of teaching without any specific emphasis on GLSs. In other words, they did not have any training to apply GLSs. However, the experimental groups had explicit instructions on effectively employing GLSs. Nine GL strategies were emphasized in this study. These included generating concept maps, summarizing, generating explanations, elaborative interrogation, self-explanation, generating predictions, teaching, self-testing, and enacting (see the literature review section above). General instructions were provided to the participants in the exp. Groups to use all those nine GLSs. The explanation on how each strategy should be used was explained and also demonstrated. It was also stated that the participants should mix several strategies occasionally. For example, the participants were told they could combine the strategy of explaining with generating concept maps. They were told and shown that they had 20 minutes to study a text on a topic, and 10 minutes to explain it to a hypothetical peer who needed to become more familiar with the topic by using concept maps. The participants were informed when they had 2 minutes to complete the task. All participants were motivated to employ the whole 10-minute period but were allowed to finish early if they exhausted their explanation. The total activity time was tape-recorded.

At the end of the treatment, the post-test was given to the learners in all classes. The post-test was scored in the same way the pre-test was. Moreover, the researcher and the invited IELTS expert listened to and re-scored the audio files. The inter-rater and

intra-rater reliability of the scores were calculated and showed reasonable reliability estimated for the test.

Data analysis

This study used different statistical methods based on the research questions. Since the results of the One-Sample Kolmogorov-Smirnov test for the variables of the study showed that the data were normally distributed, the parametric tests of ANOVA and independent samples t-tests were employed to measure the differences in the learners' speaking ability and the use of GLSs in the three groups of the study. The Statistical Package for Social Sciences (SPSS) was used for this reason.

To address the first research question, one-way ANOVA was run to investigate if GL-based instruction significantly affects Iraqi EFL university students' speaking ability. Moreover, to examine if classroom mode (traditional vs. technology-based) significantly impacts Iraqi EFL university students' speaking ability, an independent samples t-test was run.

Results

In the following subsections, the data are analyzed to address the research questions one by one.

Research question one

Does GL-based instruction significantly affect Iraqi EFL university students' speaking ability?

One-way ANOVA was run to compare the participants' speaking ability in three groups of the study (EXG1, EXG2, and control). This compared the means of the three groups. Table 1 below presents the descriptive statistics of the three groups in the pre and post-test.

Table 1: *Descriptive Statistics for the performance of the Three Groups on Pre-and Post-tests*

		N	Mean	Std. Deviation	Min	Max
speaking pre-test	control	36	13.75	2.13	9	18
	EXG1	35	13.83	2.05	10	18
	EXG2	36	13.42	2.26	8	18
	Total	107	13.66	2.14	8	18
speaking post-test	control	36	15.17	2.06	10	19
	EXG1	35	16.80	1.80	12	20
	EXG2	36	17.83	1.92	12	20
	Total	107	16.60	2.21	10	20

Based on the results demonstrated in Table 1, the means of the three groups were similar in the pre-test (control group= 13.75, EXG1= 13.83, EXG2= 13.42). However, in the post-test, the means were different (control group= 15.17, EXG1= 16.80, EXG2= 17.83). To see if this difference was significant, One-way ANOVA was run. Table 2 demonstrates the results of One-way ANOVA.

Table 2: *One-way ANOVA Results for the Three Groups*

		Sum of Squares	df	Mean Square	F	Sig.
speaking pre-test	Between Groups	3.416	2	1.708	.370	.692
	Within Groups	480.471	104	4.620		

speaking post-test	Total	483.888	106			
	Between Groups	130.120	2	65.060	17.457	.000
	Within Groups	387.600	104	3.727		
	Total	517.720	106			

As presented in Table 2 above, in the pre-test of speaking, the value of F is 0.370 (Sig.= 0.692 > 0.05). Hence, as far as the pre-test was concerned, there were no significant differences in speaking ability among the three groups at the beginning of the study. However, the case is completely different in terms of the post-test. Table 2 also shows that in the post-test, the value of F equals 17.457 (Sig. 0.000 < 0.05). Therefore, it is concluded that there were significant differences among the three groups after teaching GLSs and participants using them in their learning process.

In order to ascertain which group was significantly different from the other groups, a Scheffe test as a post hoc test was run. This determined where the significant difference between various groups of the study lied. The results of this test are shown in Table 3.

Table 3: *Scheffe Test Results for Multiple Comparisons of the Three Groups*

(I) group	(J) group	Mean Difference (I-J)	Sig.
Control	EXG1	-1.63	.002
	EXG2	-2.67	.000
EXG1	EXG2	-1.03	.034

As indicated in Table 3, there were significant differences between the control group and EXG1, between the control group and EXG2, and between EXG1 and EXG2 (sig. < 0.05). So, both experimental groups significantly outperformed the control group. Further, As the mean differences show, the performance of EXG2 (GLS instruction + technology-based context) was better than EXG1 (GLS instruction + traditional context), and that of EXG1 was better than the control group.

Research question two

Does GL-based instruction in two classroom modes (traditional vs. technology-based) significantly affect Iraqi EFL university students' speaking ability?

An independent samples t-test was run to investigate whether classroom mode (traditional vs. technology-based GL-based instruction) influenced the participants' speaking ability. As stated previously, the means of post-test in the technology GL-based class (EXG2) was higher than that in the traditional GL-based class (EXG1) (17.83 > 16.80). However, an independent samples *t*-test was run to ensure the difference was significant. Table 4 presents the results of this test.

Table 4: *Independent Samples T-test for Classroom Mode*

	Levene's Test for Equality of Variances	t-test for Equality of Means					
	F Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
							Lower Upper
Equal variances assumed	.247 .621	-2.341	69	.022	-1.03333	.44142	-1.91395 -.15272
Equal variances not assumed		-2.343	68.899	.022	-1.03333	.44100	-1.91313 -.15354

As Table 4 shows, t (69) = 0.022, p <.05, indicating a significant difference in the speaking ability between the

participants of the two GL-based groups at the end of the treatment. In other words, the t-test indicated that GLS instructions in technology-based classes have a significantly higher impact on the learning and performance of Iraqi EFL learners.

Results and Discussion

This research provides the first systematic examination of the potential advantages of GLSs for improving language learning in Iraq. The purpose was to understand if applying GL-based instruction in two different environments, i.e. traditional vs. technology-based, influences the learners' speaking ability in a meaningful manner. Prior research examining the benefits of GLSs had only considered their effects on learning outcomes. They did not compare the technology-based classes to the traditional ones. This study attempted to address this gap by investigating learning consequences in these two contexts.

The authors expected to observe good final test performances in both the experimental groups compared to the control group. The findings indicated that although this happened, the students who experienced technology-based GL outperformed those in the traditional GL class significantly outperformed the latter. That is to say, on the level of learning outcomes, the classroom mode (learning in the language laboratory equipped with technological tools versus learning in the regular class) had significant effects on students' learning outcomes. This resulted in the technology-based GL learners to significantly improve their speaking ability. One possible explanation for the generally better performance of the students in EXG2 on post-test may be due to the incentive on their part to engage deeply with the class. More broadly, considering the nature of the learning environment, the

learners may have been adequately encouraged to invest the essential mental effort for making sense of the material.

The findings of the present study are consistent with the prior research, which showed the positive impacts of GLSs on learning and illuminated the critical role of these strategies (e.g. Breitwieser & Brod, 2021; Eric, 2018; Fiorella et al., 2020; Leopold & Mayer, 2015; Pilegard & Fiorella, 2016). The findings of the present study suggest that generative learning activities foster learning since the students can learn better when they are more engaged with the task.

The findings further offer implications for understanding the advantages and conditions of employing different types of GLSs to enhance learning. The study provides practical implications for choosing helpful learning strategies and technology-based contexts. Learners will profit from incorporating GLSs when learning, especially in a class equipped with technology. Moreover, teachers can encourage learners to be engaged in their learning by prompting them to use GLSs, e.g. generating verbal explanations by video-recording an explanation. Finally, the learners may need support during GL instruction/use since they may not have experienced such learning and hence cannot regulate their learning processes effectively.

Conclusion

This study enhances teachers` knowledge of how learners learn in GL-based classes and how match lesson formats with GLSs can enrich student learning processes. The findings can therefore contribute to a shift from traditional pedagogy to teaching GLSs which are influential and can make language teaching significantly more effective. Research on GLSs, in general, and the present study, in particular, have shown this as promising. There seems, nevertheless, to be a need for extending the databases and closely examining the theoretical and practical bases for such studies, as it is commonly believed that the GL instruction is limited to regular classrooms. Although there is good evidence that learning can be improved when students engage in GL, there still needs to be complementary evidence that the GL holds for computer-based learning environments, as well (Leutner & Schmek, 2014). Also, further studies seem necessary to closely investigate the function of other factors which may influence the results of GL instruction (e,g., students' motivation and tasks' cognitive load).

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